Giant Electrical To Thermal Energy Conversion In P(VDF-TrFe)-Based Polymer Ferroelectric Films

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The Electrocaloric effect has recently attracted considerable attention due to its great importance for electrical-to-thermal energy conversion, i.e., for application in new generation cooling or heating devices, which would be friendlier for the environment. Based on indirect measurements, prediction of the existence of a giant electrocaloric effect was made recently in both PZT thin films and ferroelectric polymer thin films [1,2]. A review of recent direct measurements of the giant electrocaloric effect in P(VDF-TrFE)-based ter- and copolymer ferroelectric films by a high-resolution calorimeter will be given showing that the giant electrocaloric effect is in fact common in these systems. The relevance of the critical point proximity for the enhancement of the giant electrocaloric effect similar to the enhancement of the giant electromechanical response [3] will be discussed.

[1] A.S. Mischenko, Q. Zhang, J.F. Scott, R.W. Whatmore, N.D. Mathur, Science 311,1270 (2006).
[2] B. Neese, B. Chu, S.-G. Lu, Y. Wang, E. Furman, Q. M. Zhang, Science vol. 321, 821 (2008).
[3] Z. Kutnjak, J. Petzelt, R. Blinc, Nature 441, 956 (2006).